

UAS-Unmanned Aircraft Systems Training 1st – 4th November 2019



On November 1-4th 2019, World Food Program (WFP) and WeRobotics teamed up with Nepal Flying Labs to run a 5-day hands-on training and disaster simulation to improve the rapid deployment and coordination of drones in humanitarian action. WFP previously designed and ran similar humanitarian drone trainings and simulations with WeRobotics (and others) in the Dominican Republic, Peru, Myanmar, Malawi and Mozambique.

Training Agenda:

- 1) **Day 1:** training & presentations on local drone activities, coordination, drone mapping and software.
- 2) **Day 2:** Drone regulations, coordination in emergencies, code of conduct, mission planning, data protection.
- 3) **Day 3:** Operational flights, image processing and analysis, preparation for simulation exercise
- 4) **Day 4:** Disaster response simulation
- 5) **Day 5:** Debriefing and lessons learned review, panel discussion, closing.



Objectives of the training:

- Gain hands-on experience with UAS/drones planning, flights, image processing and analysis using various software and tools available.
- Practice using UAS for disaster response during a simulation exercise.
- Bring together government and humanitarian stakeholders to improve coordination to utilize UAS for preparedness and response.

The 5-day training in Nepal was largely led by Nepal Flying Labs with support by WFP and run in Nepali. 45 participants from 16 Nepali organizations participated with the training, which included an introduction to drone technologies, drone photogrammetry, imagery processing, lessons learned and best practices from past humanitarian drone missions, and overviews of codes of conduct, data protection protocols and coordination mechanisms, all drawn from direct operational experience. The training also comprised a series of presentations by Nepali experts who are already engaged in the use of drones in disaster management and other sectors in Nepal such as Civil Aviation Authority of Nepal (CAAN). In addition, the training included a co-creation session using design thinking methods during which local experts identified the most promising humanitarian applications of drone technology in Nepal.



Participants were trained on how to fly drones and program drone flights. This hands-on session, kindly hosted by Kathmandu University, was followed by another hands-on session on how to process and analyze aerial imagery. In this session, participants were introduced to Pix4Dreact and Picterra. Pix4Dreact provides an ultra-rapid solution to data processing, allowing humanitarian drone teams to process 1,000 high-resolution aerial images in literally minutes, which is invaluable as this used to take hours. Picterra enables drone teams to quickly analyze aerial imagery by automatically identifying features of interest to disaster responders such as damaged buildings, for example. While Picterra uses deep learning and transfer learning to automate feature detection, users don't need any background or prior experience in artificial intelligence to make full use of the platform. During the hands on-session, trainers used Picterra to automatically detect buildings in aerial (orthophoto) map of an earthquake-affected area.



After completing a full day of hands-on training on the second day, Nepal Flying Labs gave a briefing on the disaster simulation scheduled for the following day. The simulation required participants to put into practice everything they've learned in the training. The simulation consolidated their learning and provided them with important insights on how to streamline their coordination efforts. The drone simulation exercise was held at Bhumlu Rural Municipality, a 3+ hour drive from Kathmandu. Bhumlu is highly prone to flooding and landslides, which is why it was selected for the simulation. The simulation consisted of three teams (Authorities,

Pilots and Analysts) who worked together to identify and physically retrieve colored markers as quickly and safely as possible. The markers, which were placed across Bhumlu prior to participants' arrival, had different colors representing different subjects to be identified, e.g., Yellow = survivor; Blue = landslide; and Red = disaster damage. Myanmar has held the record for the fastest completion of the simulation in prior drone simulation exercises, since 2017, retrieving all markers in just over 4 hours. The teams from Nepal retrieved all markers in a very impressive time of 3 hours and 4 minutes, beating the number one spot of Myanmar.



The fourth and final day of the workshop consisted of a debriefing session, inviting each team and trainee to reflect on lessons learned and share their insights. For example, it was noted that feedback loops between the Pilots and Analysis Teams are important, so that pilots can plan further flights based on the maps produced by the analysts. The Analysis Teams noted that having a portal printer on hand would be ideal. The Pilots Team suggested that having different colored visibility vests would've enabled more rapid field coordination between and within teams by enabling individuals to more quickly identify who is who.

When asked which individuals or group had the most challenging job in the simulation, the consensus was the retrieval group who are part of the Authorities Team and responsible for retrieving the markers after they've been geo-located by the Analysis Team. This was particularly interesting given that in all previous simulations run, the consensus had always been

that the Analysis Team had the hardest task. These insights together with the many others gained from the training in Nepal will be added to a document on best practices in humanitarian drone missions which will be produced by WeRobotics.



After the full simulation debrief, a final session of the training was a panel discussion on the development of drone regulations to save lives and reduce suffering in Nepal. The panelists included senior officials from Civil Aviation, Home Ministry and Nepal Police. The session was run in Nepali and presented participants with an excellent opportunity to engage with and inform key policymakers. In preparation for this session, a 3-page policy document (PDF) with priority questions and policy recommendations was made by the facilitators and participants, which served as the basis for the Q&A with the panel. This policy document is attached and proposed to be considered and discussed by Ministry of Home Affairs with government and non-government stakeholders.



Participants:

- | | |
|-------------------------------------|-----------|
| 1. Min. of Home Affairs: | 3 persons |
| 2. Min. of Communications IT: | 4 persons |
| 3. Civil Aviation Authority: | 5 persons |
| 4. Survey Dept. of Nepal: | 2 persons |
| 5. Nepal Police: | 3 persons |
| 6. Armed Police Forces: | 3 persons |
| 7. Nepal Army: | 3 persons |
| 8. Land Management Training centre: | 2 persons |
| 9. Nepal Red Cross Society: | 2 persons |
| 10. Kathmandu University: | 3 persons |
| 11. ICIMOD: | 2 persons |
| 12. Unamid UNV: | 1 person |
| 13. WFP: | 5 persons |
| 14. Nepal GIS Society: | 2 persons |
| 15. Nepal Flying Lab: | 6 persons |
| 16. We Robotics: | 1 person |

Video on Youtube: Humanitarian Drone Training for the UN in Nepal

<https://www.youtube.com/watch?v=KTMSvxBK3I&feature=youtu.be>

Acknowledgements: *WFP Nepal would like to sincerely thank WeRobotics, Nepal Flying Labs and WFP HQ for the support and organization to run this training and thanks to the Belgium Government for funding this training. To all 40+ participants, a sincerest thanks for all the energy you brought to the training and for your high levels of engagement throughout each of the 5 days, which significantly enriched the training.*

Attachments:

- Nepal humanitarian drone training policy recommendations
- Agenda
- Participants list
- Post-training survey results from participants



NEPAL HUMANITARIAN DRONE TRAINING POLICY RECOMMENDATIONS 2019

Drones are becoming increasingly popular, and so is their application in humanitarian missions across the globe. Hazards and disasters result in the loss of lives and the destruction of infrastructure, often making conditions so difficult or dangerous that relief workers are unable to access affected areas to provide assistance. Nepal is one of the most disaster-prone countries in the world. As such, the use of drones for humanitarian purposes could significantly create better results in terms of emergency responses, better disaster preparedness, better situational awareness and better data for planning for hazard mitigation. Given the significant need for the use of drones in the context of Nepal, a “UAS training on coordination of drones in humanitarian action” was organised by the World Food Program (WFP) with WeRobotics and Nepal Flying Labs serve as trainers and technical partners thanks to the invaluable support of the Emergency Telecommunication Cluster and the Belgium Government.

The training comprised 45 participants representing a diverse sectors including the government authorities, INGOs, security agencies as well as private institutions. The training was aimed at sensitizing and transferring both the knowledge and the capacity to use drones in humanitarian missions safely, responsibly and effectively. In addition, the training included a full-day disaster simulation to reinforce all the learnings from the training, including best practices, standard operating procedures, codes of conduct, check-lists, imagery capture, imagery processing and imagery analysis. The training thus comprised theoretical sessions, plenary talks, presentations from leading organisations and stakeholders in the field, practical hands-on trainings and a live disaster response simulation. The training model and simulation was developed and implemented by WeRobotics in multiple countries around the globe has seen huge positive response from participants.

After acquiring hands-on knowledge on the use of drones in humanitarian action, a number of key recommendations were formulated by various participants and organising partners for consideration by the Nepal Government:

- Nepal Government is doing better in DRR related programs than in the past, but it is time that government go beyond traditional capacity building practices and trainings, and focus more on promoting practically-oriented DRR simulations with drones, GIS and other mapping technology, in all the provinces of Nepal along with special focus on disaster prone areas.
- Its has been clear to all the stakeholders that drones play a vital role in today's DRR scenarios. To this end, Nepal Government needs to promote research, development and manufacture of drone technology inside Nepal. They also need to provide dedicated air space (drone corridors) to researchers and makers to test, practice and refine their technology. We recommend that the government define such drone corridors possibly within or near Kathmandu Valley, providing ease of access to numerous drone professionals and academicians, while at the same time addressing the need to make the research dedicated airspace at a safe distance from settlements, existing airspace and sensitive areas. An increasing number of governments around the world are establishing drone corridors. Nepal Government thus has the benefit of learning from others in this space.



- Considering the huge benefits of drones and related robotics technologies in disaster response and humanitarian action, Nepal Government needs to formulate a simple set of regulations under the coordination with National Emergency Operations Center (NEOC) for emergency situations to help speed up recovery and response, while keeping the policies strict enough to prevent unauthorized drone users from operating.
- Nepal Government needs to develop a single digital platform that can track/record all drone activities in the country instead of traditional record keeping system where its highly impractical to track the use of drones within the country. An increasing number of governments around the world are setting up such digital platforms. Nepal Government thus has the benefit of learning from others in this space.
- Everyone with a drone is basically a drone pilot in Nepal. The ever increasing number of drone pilots is only going to create a worse situation for proper management with the lack of clear set of standards. Hence, Nepal Government needs to dedicate an authority and create standards defining “A professional drone pilot”, and create provisions for certification examinations that would only allow strict professionals to operate legally. For this, Nepal Government could partner with existing drone based service providers in the country and begin working on preparation of such a set of standards and certification examinations. An increasing number of governments around the world are setting up such certification standards. Nepal Government thus has the benefit of learning from others in this space.
- There is a strong need to organize more sensitization and awareness raising activities regarding the potential benefits and threats of this technology so that more people and organizations would be aware about the potential of this technology.
- Visit Nepal 2020 is actively promoting tourism in Nepal and planning to attract a significant number of tourists. Many of these tourists may bring their photography / videography equipment including drones. Instead of strictly discouraging the use of drones, the Nepal Government should design a more targeted policy to sensitize foreigners regarding the policies and the proper way of using drones in Nepal. For instance, installation of many information boards in airport arrivals and customs, banners with info on the policies, requirement to register the drone at customs, etc. An increasing number of governments around the world are already implementing these policies. Nepal Government thus has the benefit of learning from others in this space.
- Drones are associated with invasion of privacy and other security threats but also have the ability to save lives and reduce suffering in humanitarian disasters. Considering the very sensitive nature of this technology, Nepal Government must design strong monitoring plans in addition to the set of rules that controls the use of this technology so that humanitarian and other safe actions like R&D are encouraged while threat activities are prevented.
- Most of cargo drones used for medical deliveries and other health aid purpose are relatively heavier than mapping drones, i.e., they are large C category drones as dictated by the policies of Nepal. The Nepal Government needs to create a mechanism to enable trusted and professional organizations who meet relevant standards in terms of operations and project execution for such important life saving projects. The Government should also design flexible policies for such projects.



Humanitarian Drone Training 2019 Event Flow Agenda

Day 1 – 4th November 2019

Time	Activity	Presenters/Resource Person	Location / Requirements	Notes
8:30-9:15	Breakfast		Hotel Greenwich, Sanepa	
9:15-9:30	Registration		Hotel Greenwich, Sanepa	
9:30-10:00	Event Opening	WFP	Hotel Greenwich, Sanepa	
1:00-10:15	Welcoming and Self-introduction	WFP	Hotel Greenwich, Sanepa	
10:15-10:30	Participants share key objectives & Trainers share Training goals	Open	Hotel Greenwich, Sanepa	
10:30-11:00 Short Tea Break				
11:00-11:30	Presentation on National/Local disaster response from local stakeholders	Nepal Police	Hotel Greenwich, Sanepa	Confirmed
11:30-11:45	Q & A Session	Open		
	Presentation on Local drone projects from local stakeholder		Hotel Greenwich, Sanepa	
11:45-12:00	Nepal Flying Labs & Rise of UAV Use in NEPAL Post Gorkha Earthquake	Nepal Flying Labs	Hotel Greenwich, Sanepa	Confirmed
12:00-12:15	National Mapping Agency ongoing and planned drone activities.	Survey Department of Nepal	Hotel Greenwich, Sanepa	Confirmed
12:15-12:30	Drones for Glacial Mapping	ICIMOD	Hotel Greenwich, Sanepa	Confirmed
12:30-1:30 Lunch Break				



1:30-1:45	UAV trainings and programs to Surveying and Mapping Professionals at LMTC	Land Management Training Center	Hotel Greenwich, Sanepa	Confirmed
2:00-2:15	Academia	Kathmandu University	Hotel Greenwich, Sanepa	Confirmed
2:15-3:30	Let's Coordinate Open discussions on challenges and opportunities as defined by local stakeholders (using design-thinking methodology developed by WeRobotics).	WeRobotics and Nepal Flying Lab	Hotel Greenwich, Sanepa	
3:30-4:00	Introduction to WeRobotics and Flying Labs with key focus on localization + Q&A	WeRobotics and Nepal Flying Lab	Hotel Greenwich, Sanepa	
4:00-4:30	Let's Fly, Let's Map Introduction to Drone Technology and Software Introduction to Imagery Processing and Analysis (including AI solutions)	WeRobotics and Nepal Flying Lab	Hotel Greenwich, Sanepa	
4:30 -5:00 High Tea				

Day 2 – 5th November 2019

Time	Activity	Presenters/Resource Person	Location / Requirements	Notes
8:30-9:15	Breakfast		Hotel Greenwich, Sanepa	
9:15-9:45	Let's Coordinate Presentations on Drone regulations and guidelines Open discussions to define regulatory challenges and opportunities	CAAN	Hotel Greenwich, Sanepa	
9:45-10:15	Q & A Session	Open		
10:15-10:30 Group Photo				



10:30-11:00 Short Tea Break				
11:00-12:30	Let's Coordinate Drones in Humanitarian Action - Operational Deployments (including cargo cases) Drones in Humanitarian Action - Lessons Learned (both tactical and operational)	WeRobotics	Hotel Greenwich, Sanepa	
12:30-1:00	Q & A Session	Open	Hotel Greenwich, Sanepa	
1:00-1:45 Lunch Break				
1:45-2:45	Let's Coordinate Drones in Humanitarian Action - Code of Conduct Drones in Humanitarian Action - Data Protection Drones in Humanitarian Action - Coordination Mechanisms	WeRobotics	Hotel Greenwich, Sanepa	
2:45-3:00	Q & A Session	Open	Hotel Greenwich, Sanepa	
3:00-4:00	Preparation for Day 3: Lets Fly and Lets Map Introduction to Drone Photogrammetry and Mission Planning	Nepal Flying Labs	Hotel Greenwich, Sanepa	
4:00-4:30 High-Tea				

Day 3 – 6th November 2019

Time	Activity	Presenters/Resource Person	Location / Requirements	Notes
7:30-8:00	Breakfast		Hotel Greenwich, Sanepa	Please come on time.
8:10-10:10 Travelling to field site (Departing sharply at 8:10)				
10:10-10:30 Tea Break				



10:30-12:30	Hands-on Applications: Mission Planning and Operational Flights	WeRobotics /Nepal Flying Labs	Dolalghat/Dhulikhel Kathmandu University	
12:30-1:00 Group Photo				
1:00-1:30 Lunch Break				
1:30-3:00	Let's Map Hands-on Applications: Imagery Processing and Analysis (Includes pix4d, AI and qgis)	WeRobotics/Nepal Flying Labs	KU/Dhulikhel Kathmandu University	Please Bring your personal laptop
3:00-3:15 Tea and Coffee Break				
3:15-3:45	Simulation Preparation: Let's Coordinate, Let's Fly, Let's Map Introduction and preparation for full-day disaster response simulation	WeRobotics/Nepal Flying Labs	KU/Dhulikhel Kathmandu University	Please bring your personal laptop
3:45-5:45 Travelling back to Hotel Greenwhich				

Day 4 – 7th November 2019

Time	Activity	Presenters/Resource Person	Location / Requirements	Notes
7:30-8:00	Breakfast		Hotel Greenwhich, Sanepa	Please come on time.
8:10-10:10 Travelling to field site (Departing sharply at 8:10)				
10:10-10:30 Tea Break				
10:30-12:30	Let's Coordinate, Let's Fly, Let's Map Full day disaster response simulation	WeRobotics /Nepal Flying Labs	Dolalghat	
12:30-1:30 Lunch Break				
1:30-2:30	Full day disaster response simulation	WeRobotics/Nepal Flying Labs	Dolalghat/KU, Dhulikhel	Please Bring your personal laptop
2:30-3:00 Group Photo & Tea Break				
3:00-3:30	End of day debrief on lessons learned	WeRobotics/Nepal Flying Labs	Dolalghat/ KU, Dhulikhel	Please bring your personal laptop
3:30-5:30 Travelling back to Hotel Greenwhich				



Day 5 – 8th November 2019

Time	Activity	Presenters/Resource Person	Location / Requirements	Notes
8:30-9:00	Breakfast		Hotel Greenwich, Sanepa	Please come on time.
9:00-10:30	Let' s Coordinate Review of lessons learned from simulation (Gap Analysis) Development of best practices based on lessons learned Development of coordination checklist			
10:30-10:45 Tea Break				
10:45-12:30	Panel Discussion Regulating Drones Activities for Social Good and Humanitarian Response in Nepal Panelists: Civil Aviation/Department of Aviation Safety, Ministry of Home Affairs, Ministry of Communication and Information technology, Nepal Police, WeRobotics Open discussion on follow-up needs from local stakeholders and plan of action to ensure continuity post-training	WFP/NFL	Hotel Greenwich, Sanepa	Panelists not yet confirmed
12:30-12:45 Group Photo				
12:45-1:30 Lunch Break				
1:30-2:30	Closing ceremony		Hotel Greenwich, Sanepa	
2:30-3:00 Tea Break				
3:00-3:30	Certificate Distribution		Hotel Greenwich, Sanepa	
3:30-4:00 High Tea				

Attendance Sheet				
SL No.	Name	Organization	Email	Contact
1	Sambhu Regmi	Ministry of Home Affairs/NEOC		
2	Karuna Acharya	Ministry of Home Affairs/NEOC		
3	Indu Sharma	Ministry of Home Affairs/NEOC		
4	Bharat P Acharya	Min. of Communications and IT		
5	Suresh Babu Ghimire	Min. of Communications and IT		
6	Gauri P Acharya	Min. of Communications and IT		
7	Krishna Kumar Jha	Min. of Communications and IT		
8	Subash Jha			
9	Nabin Acharya	Civil Aviation Authority of Nepal		
10	Chuda Bahadur Khadka	Civil Aviation Authority of Nepal		
11	Sailaja	Civil Aviation Authority of Nepal		
12	Samrat Pradhan	Civil Aviation Authority of Nepal		
13	Hem Dahal	Civil Aviation Authority of Nepal		
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16	Rajib Shubba, PhD	Nepal Police	dr.rsubba@gmail.com	
17	Promod Kumar Yadhav	Nepal Police		
18	Prem Bahadur Gandarbha	Nepal Police		
19	Rajnis Khadka	Nepal Police		
20		Armed Police Force		
21		Armed Police Force		
22		Armed Police Force		
23	Rameshwor Dulal	Nepal Army		9860798384
24	Pramod Shrestha	Nepal Army		9826177533
25	Mukunda Giri	Nepali Army		9849116726
26	Sanjeevan Shrestha	Land Management Training Centre (LMTC)	shr.sanjeevan@gmail.com	
27	Mr. Gobinda Ghimire	Land Management Training Centre (LMTC)		
28	Chandra Bahadur Lama	Bhumla Municipality, Kavre		9851203477
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47	Santosh Rana	WFP	santosh.rana@wfp.org	
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49	Ram Gotame	Nepal GIS Society		
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52	Darpan Pudasaini	Nepal Flying Lab		
53	Aneel Mandal	Nepal Flying Lab		
54	Pukar Parajuli	Nepal Flying Lab		
55	Subash Gurung	Nepal Flying Lab		
56	Pravin Gyawali	Nepal Flying Lab		
57	Patrick Mejer	WeRobotics	patrick@werobotics.org	

POST-TRAINING SURVEY

QUESTIONS	A	%	COMMENTS
1. Organisation			
Humanitarian	12	30%	
Government	20	50%	
Academic	2	5%	
Private sector	3	8%	
Military	2	5%	
Other	1	3%	Inter government
Total	40		
2. Training met my expectations			
Strongly agree	7	18%	
Agree	33	83%	
Disagree		0%	
Strongly disagree		0%	
Total	40		
3. The amount of content was relevant			
Strongly agree	9	23%	
Agree	26	65%	
Disagree	5	13%	
Strongly disagree		0%	

Total	40		
4. Good variety of content delivery methods			
Strongly agree	11	28%	
Agree	29	73%	
Disagree		0%	
Strongly disagree		0%	
Total	40		
5. Key takeaways			
Use of drones for post-disaster	6		
Coordination between different stakeholders	2		
Piloting	4		
Rules and regulations needed for the use of UAS	4		
Simulation	3		
Use of drones for surveillance			
Drone safety			
Drone technology lessons learnt			
Use of drones to help beneficiaries			
Interaction with security personnel			
UAS for humanitarian response			
6. Most beneficial outcome			
How to communicate / coordinate with others	5		
Data / map analysis	3		
Hands-on applications and practice	2		
Learning the software for processing of drone images			14
WFP engineering unit			
Drones for post-disaster response			
Disaster management techniques + real time applications			
How to register the drone			
7. My Favorite part was			
Simulation	11		
Pannel discussion	3		
Presentations from various stakeholders	2		
Trainers	2		
Government presentations and policy			
Interactive approach			
Teamwork			
8. Suggestions for improvement			



Add extra time for hands on practice and data processing	11		
more frequent training / refresher course			
increase the amount of simulations			
Add two days of hands on practice and data processing			
Let's COORDINATE was missing			
a mission planning session			
More dat analysis			
More equipment			
High level authorities did not participate in the pannel - they should			
The theory session is more docused on process of drone than the implementation and results			
Limit the number of participants			
Better time management			
Manual of the whole programme			
Cover more agencies			
Advanced training			
9. Which committee would you like to join			
Policy recommendations	13	25%	
Digitalization	9	17%	
Emergency	8	15%	
Data Analyst	18	35%	
Other	4	8%	drone piloting (2), research (1)
Total	52		
* people indicated more than one committee hence the total number is higher than the number of participants			